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ABSTRACT

This paper examines five key trends impacting higher education administration: (1) traditional funding sources are flat or decreasing; (2) public expectations and state mandates are calling for more reporting requirements and accountability; (3) consumer expectations demand more sophisticated services requiring greater access to date; (4) evolving organizational structures will significantly change traditional hierarchies; and (5) sophisticated knowledge workers require expanded technical and consulting support. Each trend is introduced with a question or issue that might occur to a campus chief executive, followed by an assessment of organizational and technological implications, with economic implications discussed where appropriate. The paper seeks to demonstrate that, rather than being part of the problem, information technology is part of the solution. New strategies are proposed to deal with change, using information technology tools to meet the challenges of administering higher education in the information age. (Contains 50 references.) (JDD)

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Organizational and Technological Strategies for Higher Education in the Information Age

by David J. Ernst, Richard N. Katz, and John R. Sack

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Table of Contents

1 Introduction 1

2 Trends and their Implications 2

Trend 1: Traditional funding sources are flat or decreasing 2

Trend 2: Public expectations and state mandates are calling for more reporting requirements and accountability 5

Trend 3: Consumer expectations demand more sophisticated services requiring greater access to data 8

Trend 4: Evolving organization structures will significantly change traditional hierarchies 11

Trend 5: Sophisticated knowledge workers require expanded technical and consulting support 15

3 Building Tomorrow's Organization 19

Bibliography 21

Corporate Sponsor Profile 24

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1 INTRODUCTION

Three forces of change—organizational, technological, and economic—are under way and gaining momentum in higher education today. Each is prompting discussion, study, frustration, and, in some cases, fear. Taken together, these change forces will alter the nature of higher education. They have brought us face to face with hard choices about how to harness and direct these alterations without becoming their victims.

A set of *organizational forces* has moved colleges and universities along a path of greater decentralization, enabling departmental and personal empowerment. *Technological forces* have pushed us toward distributed, client/server, and cooperative processing environments. *Economic forces* are impacting both organizations and technology and are challenging the very existence of some institutions.

Campus executives—and information technology (IT) professionals especially—are beginning to comprehend the magnitude of institutional and environmental change in the information age. In many higher education publications and gatherings, the operative words are *transformation, restructuring, reengineering, rethinking, innovation.*

We live and work within a context of accelerating change and a season of choices—there are right paths and wrong paths, critical directions need to be chosen, and time is of the essence. The momentum of change is sufficiently great that it is not enough simply to make wise choices; if we do not also make those choices quickly we risk being overrun by change rather than being its agents, enablers, or facilitators. This brings to mind Lee Iaccoca's admonition to "lead, follow, or get out of the way," and is particularly sobering to those acculturated to the dictates, norms, and values of higher education's unique shared governance model, who rightly and necessarily operate in a time-consuming environment of discussion, intellectualization, consultation, and consensus-building.

This paper examines five key trends impacting higher education administration that were among those identified in *HEIRAlliance Executive Strategies Series Report #1*, published by the Association of Research Libraries, CAUSE, and Educom in September of 1992. Each trend is introduced with a question or issue that might occur to a campus chief executive, followed by an assessment of organizational and technological implications, with economic implications discussed where appropriate. In particular, this paper seeks to demonstrate that, rather than being part of the problem, information technology is part of the solution. New strategies are proposed to deal with change, using information technology tools to meet the challenges of administering higher education in the information age.

2 Trends and Their Implications

As the president sits in her office pondering the many changes impacting the administration of her institution, she narrows the list to the five she believes are most relevant and most shared by other colleges and universities. She knows that economic issues run through all of them, but each has its own set of organizational and technical implications. She decides to call a series of meetings with the provost, vice president for administrative affairs, and vice provost for information resources to address each of the five trends on her list. What follows is a distillation of the points of view and approaches discussed at these five "trends" meetings.

Trend 1: Traditional funding sources are flat or decreasing

> *Whether institutions are public or private, large or small, the funding available is falling far behind the requirements. Some institutions are responding by focusing more on information technology, while others are questioning its effectiveness. Can information technology help with this challenge?*

Organizational Implications

We live and work today in what some describe as an "era of events." While the historical ideal of the academy as an ivory tower continues to influence our vision of colleges and universities, our institutions have become inextricably linked with the communities we serve. If the global village metaphor is an appropriate one, then we may assume that events occurring across the globe can and will affect the behaviors, values, decisions, and priorities of the academy. While a global context may be the proper one for twenty-first-century higher education decision-making, it is a relatively new planning context for most of us. Few of us have anticipated the organizational and technical requirements and capabilities that will be expected of colleges and universities in a global and event-driven context.

Failing to identify such requirements or to develop these capabilities, there is a risk that college and university leaders will tend to respond to events rather than to plan for them. The failure to institutionalize strategic planning as an element of "normal operations"[1] has led us to become, as some call us, adhocracies; that is, reactive institutions that grope from event to event, inventing homemade solutions to immediate pressures. The immediacy of our problems predisposes us to embrace quick and easy solutions—like across-the-board cuts—in lieu of developing an understanding of the trade-offs between complex priorities set in the context of strategic objectives. Who among us, for example, can articulate our institution's vision and strategy of administration?

As events overtake us, we are discovering the limits of adhocracy as a planning and decision-making paradigm. Some of us have begun to view our institutions' administration in the context of our academic plans. It is for this reason that we are now hearing with increasing frequency about emerging productivity enhancement strategies such as infrastructure investment, total quality management (TQM), business process reengineering (BPR), research incubators, outsourcing, distance education, and other strategic management initiatives and methodologies.

Technological Implications

To sustain the quality of our academic institutions, we must begin to shift the focus of the information technology function away from optimizing machine efficiency and towards enhancing human productivity and effectiveness. Technology investments that help us produce more and fancier reports must yield to investments in those technologies that enable faster transactions and better decisions.

Old Strategy:
Budgetary feeding frenzy

New Strategy:
Fixed resource reality

In the 70s and early 80s, for many of us every new thing we took on seemed to come with new money. Everything we did was additive. In the 90s, it is clear that we've got to rethink the way we accomplish our work—as Michael Hammer suggests, don't automate it, obliterate it[2]—in order to free up time and money for new and important goals. We're now leaving behind the mindset that said that the services we have provided for the longest time must be the most important ones, so when cutting budgets, let's start by cutting the new initiatives. We now know that some of the newest things we are doing have the potential for the greatest payback to our institutions. Budget cutting has progressed from "last in, first out" to "least valuable, first out."

Old Strategy:
Build new systems

New Strategy:
Build information infrastructure

In the two decades past, much of our effort went into building new applications, as we were completing the suite of applications that brought automation to nearly all campus business processes. Now we are more

Figure 1
Imperative: Increase Administrative Productivity

Adhocratic	Planning Centric
Cut expenses across the board	• Develop a vision • Identify academic priorities • Rethink mission/markets • Nurture internal growth sectors
Cut administration deeper	• Redefine administration • Eliminate unnecessary work • Dismantle unproductive policy • Reengineer processes • Leverage the IT infrastructure • Attack paperwork
Tighten procedures and seek scale through centralization	• Empower employees • Leverage the private market • Embed procedural controls in IT infrastructure

focused on leveraging such investments by distributing access to these legacy systems around the campus. The focus is no longer on capturing and storing information as it has been for our transaction systems. We now recognize that information gains value as it moves around the institution and is used by many people in many contexts. The exchange of information between a supplier and a consumer is facilitated by new networking technologies. Leveraging the "installed base" of data and systems provides new value without building entirely new systems.

Old Strategy:
Avoid new technologies

New Strategy:
Adopt new technologies

In the 70s and early 80s, new technologies were the most expensive and risky technologies. So to save time and money we avoided trying anything that departed dramatically from our installed base. In recent years, new technologies are increasingly cheaper than the technologies they replace. And in some cases new technology—if it isn't "bleeding edge"—can be less risky than what it replaces; that difference is often reflected in the maintenance prices vendors charge for hardware that is old, versus hardware that is newer. And a simple fact often overlooked by our colleagues, who wonder why our services don't automatically get cheaper each year when they read about our industry's price/performance improvements, is that you can't get the price/performance advantages of our industry's wares if you don't actually replace your poor price/performance equipment with something having a better price/performance ratio.

Old Strategy:
All-or-nothing outsourcing

New Strategy:
"Cellular" outsourcing and leasing

When the concept of outsourcing emerged as a business strategy, it tended to be viewed as an all-or-nothing proposition in which information systems functions were potentially provided by an external company under contract. But in the last few years as in-house IS organizations have perforce become more creative in providing improved service at reduced cost, we have recognized that (1) functions can be selectively outsourced, and (2) "sourcing" is a continuum, from insourcing through partnering to outsourcing. Selectively, one might choose to outsource functions like printing, or even just impact printing; many shops have "outsourced" microfiche printing for years, without even calling it that. Similarly, one might elect to use a third party to provide assistance in an architectural transition, having it take over legacy systems maintenance, for example. On a sliding scale from "insourcing" to "outsourcing," you can elect to partner with a vendor to develop a system to your specifications, and then the vendor turns the system over to you for maintenance, or, in a different outsourcing option, you treat the system as a purchased package and pay the vendor for maintenance.

Old Strategy:
Automate manual processes

New Strategy:
Reengineer business processes

In the 70s and 80s we would "harden" our manual business processes into systems that would "automate" the manual function. We made the business more efficient. But in the 90s—now that most of our manual processes have been automated—the message is that we can save the institution the most money by rethinking, or reengineering, the business process into an effective one before turning it into an efficient process in software.

Old Strategy:
Reduce service points, hours, and selection

New Strategy:
Provide services throughout and beyond the campus, around the clock

Our first reaction when budgets are reduced is to look for services to cut, or reduce the number of locations we provide service, or the hours during which a service window or phone is open. No doubt these approaches save money. Yet we may be able to use our systems in ways that appear to our customers to be service enhancements, while we know that the new

service actually saves money. In the banking business, the automated teller machine was an example of this kind of approach. Especially when we are dealing with the most peripatetic of our customers—faculty and students, who after all are engaged in producing and consuming the very stuff we say we manage—they may feel better served by us if we trade off some of our paper-based and expensive processes for electronic ones that are available around—and beyond—the campus, around the clock.

Old Strategy:
Marginally-scalable mainframes

New Strategy:
Maximally-scalable workstations

A major reason many campuses are pursuing client/server technologies so vigorously is the scalability of the desktop environment. Why is this important? Because the information economy requires so much more access by so many more people, it is important to bring desktop equipment into the picture. Since the number of users is growing so rapidly, it is that portion of the technical environment that must scale in easy and affordable increments.

Old Strategy:
Utopian: evangelize, revolutionize

New Strategy:
Realistic: consolidate, institutionalize

Many of us in the last decade got caught up in our own rhetoric and too readily believed our own press. Our sweeping visions of the 80s don't fit the times now; the visions are not wrong so much as they exceed our real ability to plan, fund, implement, and deliver. The radical visions required revolution, and we can see how slowly that comes to the faculty. Our approach now should be more to look at what successes we have had, and to try to package them, to leverage them, to get our best real products in the hands of more people in our institutions.

TREND 2:
Public expectations and state mandates are calling for more reporting requirements and accountability.

Every time we turn around it seems there's a new investigation or state or federal audit going on. Before long most of the staff will be devoted to creating reports! The need for increased accountability raises fundamental questions about the nature of our priorities and about how our performance is monitored and communicated to the constituents we serve.

Organizational Implications

For the post World War II period, American colleges and universities have operated in a positive growth environment stimulated by: (1) the G.I. Bill; (2) the baby boom; (3) the dramatic increases in federal and private sponsorship of university research; (4) growth in student financial aid; and (5) the growth in many states' tax bases. These demographic trends, plus public policies towards and investments in higher education, have made U.S. postsecondary education the envy of the world. In many ways these policies and investments served to create a seller's market for postsecondary instruction and sponsored research. Beginning in the late 1980s, and for the foreseeable future, structural changes to the U.S. economy—changes shaped by burgeoning government deficits, the baby bust, and the emergence of an information economy—threaten to alter, at best, and possibly erode this legacy of investment and support.

The effects of these more recent trends are exacerbated by a perceived inability of colleges and universities to manage their resources responsibly, to control their costs, to balance research priorities with teaching, and to meet the educational needs of young people joining the work place in the twenty-first century. The ultimate effect of the concurrent rise in tuition and decrease in the availability of college-eligible students will be an increase in public scrutiny of colleges and universities. In what some characterize as an emerging

buyer's market for higher education, parents, students, donors, research sponsors, and legislators will demand increasing institutional accountability for the quality of all aspects of campus activity.

Such pressures demand a corresponding rethinking of our operations. Just as the event-driven and interdependent nature of campus life suggest the limitations of adhocracy and incrementalism as higher education's prevailing planning and resource management strategies, so does the increased need for public accountability trumpet the limitations of bureaucracy, as higher education's prevailing internal control strategy. In effect, our strategy to date has had to allow the prevention of transaction errors to shape and define our administrative structures and systems. In creating a never-ending cycle of audits, proceduralization, forms generation, signature authorization, and centralization of decision-making, we have lost sight of our constituents and have created administration for its own sake and a culture averse to risk.

Notwithstanding the very real pressures for transactional accuracy and operational openness, we must seek to rethink our operations from a viewpoint of desired outcomes. Such outcomes must be informed by the needs of those we serve. We must develop the ability to understand, make explicit, communicate, and negotiate the inherent trade-offs between overhead-laden operations that are allegedly "risk free" and streamlined operations that depend increasingly on employee judgment through deeper delegations of authority.

Reliance on human judgment, rather than procedure, is inherently risky. Some organizational consultants have characterized bureaucracies as "organizations of mistrust." In essence, we must help our leaders determine how much trust they are willing to invest in their administrative staff, or, conversely, how much they are willing to spend in procedural control to replace that missing trust. Finally, we must take advantage of the emerging information technology environment to reduce the risks of error, to eliminate redundant work, and to provide timely and meaningful information to assess our success in achieving the outcomes we seek.

Technological Implications

Information technologies and architectures designed for bureaucratic control differ substantially from those designed for employee empowerment. Symbolically, the signature as the embodiment of managerial control and oversight assumes the existence of paper and encumbered our former systems with the need for paper-based input documents and outputs. Information technology that is designed to empower people focuses on access to information and on optimizing the flow of processes. The ultimate process optimization is full electronic commerce that is unencumbered by the need for paper-based checks and controls.

Old Strategy:
New reports

New Strategy:
EDI from source to sink to source

In the stovepipe "islands of automation" we built in the 70s and 80s, the quickest way to determine if two

Figure 2
Imperative: Enhance Controls and Reporting

Old Strategies	Emergent Strategies
Introduce new rules	Specify desired outcomes
Introduce new forms	Negotiate acceptable risk
Acquire additional signatures	Imbed controls in IT
Centralize approval authority	Measure and evaluate continually

systems contained the same information was to write a report to run against one system and compare it to a report run against the second system. Of course, the comparison was done manually. Many of the reports we developed over the past two decades were not for management information, but to balance against another automated system or to serve as input into another computer system.

Now, using the techniques of electronic data interchange (EDI), we can move transaction information from one system to another without tightly coupling or integrating the two systems. While EDI is most often used to move information between two companies, there is no reason the same "store and forward" messaging techniques can't be applied within an instituion.

Old Strategy:
Information politics: feudalism

New Strategy:
Information policies: federalism

An article on information politics in the *Sloan Management Review* describes five stages of information politics, two of which seem most relevant to universities: feudalism and federalism.[3] The five stages are technocratic utopianism, anarchy, feudalism, monarchy, and federalism. Information sharing and reporting is not a politically neutral activity, and is different in each of these. We need to be aware of which phase we are in before we try to "improve" reporting.

In information feudalism, information is managed disjointedly by powerful lords and barons—we know them as deans and vice presidents, perhaps—in individual units. These people define their own information needs and report limited information to the overall commonwealth. Note that the stronger the feudal lords, the weaker the monarch. Many of us see examples of this as we move around our campuses trying to see which fiefdom has dammed the information flow upstream.

Now in information federalism, negotiation and consensus are used to bring parties together; important information is put in easy-to-access data warehouses and there are common expectations for reporting information. Note that this is beyond the monarchy stage, in which, according to Davenport, Eccles, and Prusak, a strong central authority attempts to eliminate politics.

Old Strategy:
Transaction applications have integrated reporting

New Strategy:
Reporting is separate from transaction capture

Back in the days when most reporting was from one internal organization to another, and when the reporting requirements were relatively stable, we structured our transaction applications and data to produce a set of reports regularly and efficiently. Each application had its own reporting mechanism, which understood the typical uses of data in the application.

But now, as reporting requirements mushroom because of external demands and because we are using our systems for problem solving and decision support as well as control, we need to separate our reporting mechanisms and data from the transaction mechanisms. This is not only a matter of efficiency and performance; it is also a way of separating things that are very dynamic—like reporting requirements—from things that are relatively more stable—like the transaction processes, controls, and data themselves. In something like a client/server sense, reporting becomes more flexible and scalable when it is separated from the stable base of operational systems and data. And, in the new client/server technologies, the tools for reporting seem to be more mature than those for large-scale transaction processing.

Old Strategy:
Need-to-tell, desktop publishing

New Strategy:
Need-to-know, document repositories

Since the Macintosh created the desktop publishing marketplace, we've been able to very efficiently create tons of paper documents. And having all these pretty paper documents, our distributed publishers had a lot of pride in seeing that everyone had a copy. So the source of the document also distributed the document,

on paper. Our campuses are awash in newsletters and flyers, reporting whatever people have need to tell to anyone who has an interdepartmental mailbox. Publishing more reports in this manner rarely results in people being better informed.

There is now more than enough information to go around. Several campuses are working on a concept called "document repositories," which store textual information until someone asks for it, and then effectively delivers it to the person who needs to know about it, when he or she needs it. This electronic retrieval and distribution controlled by the end-user is a type of "just-in-time" delivery on demand. But the publishing process itself is still "just in time" from the publisher's point of view, and the technology of the document repository allows the same kind of time-shifting between a document's author and its readers that we're familiar with the VCR providing, between broadcaster and viewer.

Trend 3:
Consumer expectations demand more sophisticated services requiring greater access to data.

> *Faculty and staff in schools and departments continually complain about the non-responsiveness of central offices—especially in information systems.*

Organizational Implications

In responding to the pressure for greater information access, we need to adopt a more *consumer* or *customer* orientation. Not surprisingly, the bureaucratic control model and incrementalist problem-solving model foster organizational cultures characterized by guardianship, gatekeeping, controlling, and regulating. These cultures are reinforced by our reward systems which often favor administrators who haven't "done anything wrong." In their most virulent manifestations, we are at risk of creating administrative cultures of control that strive to protect the institution from the students and faculty. Compare, if you will, our business partners' talk about "delighting the customer," with some of our talk about "herding cats."

Of the seventy institutions identified by Clark Kerr, former president of the University of California, as having been in continuous existence since the Reformation, sixty-six are colleges and universities.[4] This record of endurance and stability cannot be ascribed to our unique and enduring bureaucratic control model and administrative service culture. The point here is that there exist uniquely creative and durable elements of campus life and that the mission of campus administration must become, in part, a mission of discovery. While in the past thirty years college and university administrators have imported the best and worst of private sector organizational and decision-making models—such as the specialization of labor and management by exception—we must now rediscover and codify successful

Figure 3
Imperative: Adopt a Consumer Orientation

Old Strategies	Emergent Strategies
Do things right	Do the right things, right
Assure compliance	Become a problem solver
Foster specialization	Empower generalists
Manage by exception	Create centers of competency
Safeguard institutional data	Promote access to information

processes and models intrinsic to the academy, and blend with them the best of emergent consumer-oriented models such as TQM and business process reengineering from the private sector.

A strategy of discovery suggests that we seek out those opinion leaders and even renegades on our campuses who succeed outside of our systems of control and formal organization and uncover, replicate, and illuminate the competencies they have devised. The challenge is to move our organizations from ones that "just say no," to those that try to say "yes."

Technological Implications

The traditional model of information systems development assumed that the customer of IT design efforts was the functional organization that specified these systems' requirements. The trend of viewing an organizations' work through the lens of horizontal processes, rather than through vertical functions, places the focus of system development and support on the end-to-end users of these systems: students, faculty, employees, vendors. The implications of such a changed assumption about the nature of the customer and levels of expected service will affect every choice facing IT organizations.

Old Strategy:
Love thy products

New Strategy:
Love thy customers

The message here is obvious. We need to focus on the customer, and his or her needs, rather than on our products and their features. In the previous decade, the best among us produced very well-supported products; now we need to have very well-supported customers.

Old Strategy:
Data owner's functional perspective

New Strategy:
Data consumer's task perspective

As we are asked to provide more and more sophisticated services, we have to view those services from the perspective of the real consumer. In the 80s we built systems to automate the operations of back-office users; now we're seeing those systems move into the hands of people whose jobs are quite different, but who need occasional access to the data in these systems. How many systems, for example, would an administrator in your chemistry department have to use to perform the basic departmental task of "hiring a student"? Surely the payroll system and the personnel system, but also the financial aid system and the student records system? And perhaps one or two departmental systems? Perhaps others? If we're going to provide sophisticated services, the services need to be centered on the tasks of the users of those services, such as hiring, rather than the systems function, such as payroll, personnel, student aid. (This concept is related to the Trend 4 discussion about how systems are organized, illustrated in Figure 5, page 12).

Old Strategy:
Information drought: finding data

New Strategy:
Data deluge: finding value

In the early 80s we didn't yet have automated systems collecting data on all the University's business processes. And on the academic side, we didn't have ready network access to data delivery systems of scores of other institutions. Now we have both of these. The information drought—in which people spent their time trying to find any data at all—has become a data deluge—in which people spend much of their time sifting the data for something of value. Studies have shown that 80 percent of an analyst's item is spent gathering the "right" data, not actual productive time in analyzing them. The analyst is working the "needle in the haystack" problem and the "wheat from the chaff" problem, rather than actually doing analysis. Our solutions in the 90s have to help people select, filter, navigate, and integrate data, not just capture it.

Old Strategy:
Train users in powerful systems

New Strategy:
Build training-free "incremental" systems

Figure 4
Imperative: Facilitate Organizational Change

Old Strategies	Emergent Strategies
Add vertical layers	Create a network of networks
Enhance vertical communications	Reduce information float
Create functional "stovepipes"	Promote cross-functional integration
Use the chain of command	Use the network

In the 80s we held training classes and wrote large manuals for our "all things to all people" systems. In the 90s we should design and target subsets—or increments—of system function to users whose needs and abilities match the function and interface of the subset. Users can thus control when they are ready to take on more and more advanced subsets of system function and complexity. The better the match, the less the training burden; in many cases the system itself can deliver whatever training is needed. For example, only the fields relevant to the user's task should appear on a screen. Different fields are needed in a personnel system to hire someone than to terminate someone, yet we may use the same paper forms and online screens to do both, confusing the user who is focused on a particular task.

Old Strategy:
Classroom training

New Strategy:
"Workroom" just-in-time training

In the 80s, we took folks out of their offices and brought them to our computer classrooms to sit through lectures and later on introduced our great innovation, hands-on training. There are many more users now, and they are using many more systems per person. They can't afford to leave their offices for a day each time they need to learn another new system component. So our training in this decade should be more modular and self-directed; and it should be available at the time and place of need, in the workplace, not the computer classroom.

Old Strategy:
Administrative systems for administrative staff

New Strategy:
Students and faculty as producers and consumers

In the 80s a "separate but equal" philosophy separating academic computing facilities from administrative facilities persisted in computing long after it was outlawed in our society generally. Supposedly the hardware was different, the software was different, and the user's need and skills were different, and in the early 80s this was true to a large extent. But all these differentiators have moved together as the marketplace from which we obtain our hardware, software, and skills has become an efficient marketplace eliminating differences without a distinctive value in the market. There are fewer and fewer campuses with separate academic and administrative TCP/IP networks, for example. At the same time colleges and universities have begun to adopt a corporate technology strategy of linking suppliers and customers directly to systems. In higher education, these suppliers and customers are students and faculty to a very great extent, since they produce and consume much of the information we manage.

TREND 4:
Evolving organization structures will significantly change traditional hierarchies.

Presidents are beginning to wonder what all those people are doing who reside organizationally between them and the schools and departments. The only people who wonder about this even more are those in the schools and departments.

Organizational Implications

Organization charts are useful guides, but they are becoming more and more outmoded. Institutions and firms do not manage through structures anymore, they manage through processes.

While this concept might gain easy acceptance in the loosely coupled world of the faculty, it is perhaps antithetical and threatening to many of us associated with campus administration. If you ask all of the experts in TQM or business process reengineering to describe the typical implications of these new methodologies for organizational structure, in nearly all cases, the answer is, "There are none." The emergent organizational paradigms succeed by empowering people and horizontal processes in ways that are supplemental to—or independent of—the "formal" vertical organization.

By way of analogy, we should consider how our faculty might answer these questions: How much of your teaching and research quality can you ascribe to your formal organization, that is, the academic senate? the department? the college?

To enable the organizational transformations we anticipate, we need to shift our attention away from the organization chart—which is near and dear to all of us—and towards the creation of an information-rich infrastructure. If we can (1) eliminate the technical, cultural, hierarchical, and procedural boundaries that divide or isolate intelligent and motivated people; (2) create a policy environment that stimulates and rewards collaboration; (3) promote easy access to the kind of information people need to make sound decisions; and (4) specify, measure, and reward the achievement of defined and customer-centric objectives, we will go far in implementing many of the emergent organizational capabilities anticipated for the twenty-first century. In this process we may, or may not, have touched the formal organization chart.

Technological Implications

Note that organizations evolve not just because they change, but because we change our point of view in looking at the work of an organization—just as the universe seemingly shifted when the Ptolemaic view gave way to the Copernican view.

Work in the future will be directed in the main by cross-fuctional and self-governing teams. The effectiveness of such teams, in managerial terms, will depend on their members' access to one another, to cross-functional information, and, occasionally, to elements of the campus leadership. Such work practices will demand enhanced integration of data across functional systems, robust networking, and technical interfaces that lower the cultural barriers between diverse work cultures.

Old Strategy:
Organize systems by institution-level business function

New Strategy:
Organize systems around departmental workflow

Remember how you felt when you first went through arena-style registration at college? You went to one window and picked up a form or got one stamped, and then you went to another window down the line and turned in the form you had just picked up and maybe got another one, which you then took to another window, and so on. This is how departmental workflows integrate across central systems: by departmental "hod carrying" and "backing and filling" as the departments move information from one institution-level system to another. Figure 5 (on the following page) shows how a departmental business process—such as financial planning—

may require a user in an academic department to use four or five institutional systems, sometimes entering duplicate data.

Old Strategy:
Vertically integrated packages

New Strategy:
Data liberation

In the 80s we looked for packages that provided a complete set of technical functionality. Packages had to have their own data entry and validation screens, data dictionaries, a built-in database and retrieval language, and a report generating system. These were what we called "vertically integrated" packages. Now we see what kinds of costs such packages have; they hold the data they contain—which are usually structured for internal processing efficiency and integrity—captive to the manipulation routines that the package vendor has thought to provide. So when the organization that selected the package to suit its needs has changed and finds its needs have changed, the package no longer fits as well as it once did. But the data are locked up in a black box, and can only be moved in and out through relatively manual processes. Now we are all looking for

Figure 5
Institutional Systems and Departmental Processes

SCHOOL AND DEPARTMENT PROCESSES	Human Resources	Controller's Office	Sponsored Research	Facilities	Health & Safety	Student Resources	Development	
Research Administration	x	x	x	x	x	x		
Faculty Recruitment	x	x	x	x		x	x	
Financial Planning	x	x	x	x	x	x	x	
Space Planning	x	x	x	x	x	x	x	
Curriculum Support	x			x	x	x		
Faculty Support	x	x	x	x	x	x	x	
Student Support		x	x	x	x	x	x	

Across the top are typical systems provided by the institution's central administrative offices; along the side are typical departmental processes. Note how poorly matched they are to each other.

packages that at least give us the flexibility of gaining access to the data store through standard database management system query tools and other tools that are part of a more open environment, that is, "liberated" from a type of vendor "lock in."

Old Strategy:
One-size-fits-all solutions

New Strategy:
Departments drawing from the common "data well"

Twenty years after the concept of separating data from applications was accepted, we still build most of our systems so that the database and the application are tightly integrated. This approach to software construction has made it infeasible for a department with a unique need for processing information stored in central databases to be able to use that central data without first (in the best cases!) duplicating it in a departmental database, where it should be maintained, but rarely is. Such data systems are sometimes called "shadow systems."

The fact that departments—and even individual faculty—are going to have local and unique needs not met by "corporate" information systems isn't going to change. Simply put, individual faculty, departments, and central administration run somewhat different business processes, and one group's process isn't just a subset of another, or a different view of the same data.

So these so-called "shadow systems" are in the nature of a higher education institution. If that is so, then rather than eliminating them, our goals should be to make them less necessary (by making central information more accessible), less labor intensive, and less fragile. How? One way is by constructing "data warehouses" of the central information needed, and making data in these warehouses accessible to systems and programs written by departments and individuals. By making the information available in a standard way—for example, through a standard query language (SQL) database—and in a standard, stable form, central organizations provide a common "data well" that many can draw from, rather than individually customized "point solutions" for each system that needs the data.

Old Strategy:
Integrated, omnibus packages

New Strategy:
Interoperable cellular functions

In the 80s, the big word—even before everything was relational—was "integrated." Every business function needed was tied together by a single vendor into a single package, usually around an "integrated" database. This phenomenon was as true of microcomputer software as of mainframe computer software; every vendor was trying to one-up the "integrated" Lotus 1-2-3 with more function integrated into a single shell. Most of these products failed in the marketplace because they compromised the ability of each of us to assemble our own suite of products from among those we considered "best of breed" for each of the functions we valued. By trying to be jacks of all trades, these products were masters of none. The newer vendors of large-scale business packages seem to realize that their old "protectionism" approach which locked the client into their product suite was in reality a barrier to trade and thus a barrier to the overall expansion of the market. An enlarged market, like a rising tide, raises all boats and provides new opportunity for all vendors, especially the most aggressively "open" and "interoperable" among them.

Ideally, different vendors' modules would "hand off" data as they move from one business process to another in completing a multiprocess task (like the earlier example of hiring a student). Simply having all the packages using an SQL-compliant DBMS won't accomplish this.

Old Strategy:
Buy from established vendors

New Strategy:
Buy from new-architecture start-up companies

Our past strategy of buying from established vendors meant one of the first things we would evaluate about a vendor for a major application package was the size of its installed base. A large installed base indicated that a vendor had been in business for a while, and had

successfully convinced others to buy; the installed base also indicated that a product existed!

Yet the most successful vendors of the 80s now recognize that an installed base is a two-edged sword: it provides the cash flow, market visibility, and referenceable accounts a company needs to fuel grow th, but the installed base is a type of ballast that ties a vendor into a cycle of enhancing—rather than replacing—its legacy products. The installed base prefers a steady stream of minor upgrades in the current architecture to a cataclysimic product replacement with a new architecture.

For this reason, the vendors whose application packages are leading the market in open, client/server products are newer companies who could start from scratch in developing a new product to meet today's needs. They were not encumbered by an installed base expecting compatibility and an extended migration period. These small companies move quickly, and thus they represent both higher risk and higher reward than an established, "old architecture" firm.

Old Strategy:
Architecture = coding standards

New Strategy:
Architecture = a way to connect components into systems

IS organizations in colleges and universities have for the most part had an architecture specified for years. In most cases these specifications were about tying modules of an application together, and about tying the application into the operating environment. All of these specifications were adequate as long as nearly all the applications ran on the same computer, and were developed by the same organization. But these assumptions rarely hold now (if they ever did). Thus, as the organizations that supply and consume information evolve, so too must the concept of architecture evolve beyond "coding standards."

The modern notion of architecture recognizes that organizational evolution is something that happens continuously, and the systems that support the changing businesses of changing organizations must be flexible and responsive. The concept of architecture is less like planning to build a home than it is like planning the services and utilities that will support the scale, scope, and fluidity of the activities in a city. Today's architecture is about organizing and connecting components of a system—and the systems themselves—together. Architecture has implications for (1) the way applications, data, tools, and equipment work with each other; (2) the skills needed by technical and office staff; and (3) how systems are developed. It is responsive to business opportunities, needs, and strategy, as well as the marketplace of business and technology suppliers and partners. Its business goal is an institutional framework for planning and linking disparate systems and data, to gain flexibility and responsiveness. Its technical goals are productivity enhancement for users and system developers, and a definition of risks, allowing actions to limit risk.

Old Strategy:
Point-to-point intersystem bridges

New Strategy:
"Virtual integration" intersystem EDI

Many of us have worked wonders building two or three bridges and gateways from one software package to two or three others. We've also driven ourselves nearly crazy because a different homebrew gateway is needed between any two packages. If the phone system worked like this, we'd need a different wire to connect our phone to every other telephone we'd like to reach. Our systems are starting to look like rats' nests—or a neophyte networker's wiring closet.

Vendors have this problem, too. One example is the difficulty an e-mail vendor might have in trying to connect a mail system based on a local area network (LAN) to other electronic mail systems on a campus; each additional different system increases the problem geometrically.

Similarly, the vendors of database management systems, in trying to prove their "openness," had to build gateways to every other system in the market, so they "architected" their way out by forming the SQL Access

Group, which goes well beyond standardizing on an SQL dialect. These new forms of links are not point-to-point links; they are the result of vendors agreeing on a common interchange approach and format. We call this "virtual integration" because, while it seems as if you have an integrated system, you have some of the flexibility that "interchangeable parts" brought to the early automotive industry.

Old Strategy:
1985: the year of SQL interoperability

New Strategy:
1995: the year of EDI interoperability

In the 80s, we thought we could connect anything to anything as long as both ends spoke SQL—interoperability Nirvana. Then we got serious and realized the SQL alone was not flexible enough, nor specific enough, to link our business systems—not just their databases—to each other. So EDI is now the new frontier—essentially a form of machine-to-machine electronic mail in which the message is structured by rules agreed to by each system in the interchange, and registered in a standards library.

TREND 5:
Sophisticated knowledge workers require expanded technical and consulting support.

If the administrative work force of tomorrow is to be empowered to make decisions without layers of rules or managers, we will need to invest in helping members of this work force realize their full potential through new tools and capabilities and ongoing training, consulting, and technical support.

Organizational Implications

To create a sophisticated and continually improving work force, we need to create and nurture learning organizations. How institutions of higher education engage their workforces in learning activities is one of our sadder ironies. Colleges and universities are, of course, learning organizations by definition. While faculty spend considerable time and effort in discovering how students learn, how much time do we in administration spend in the process of discovering how staff learn? And here we are using the term learning in the broadest sense, that is, in the sense of how do employees

Figure 6
Imperative: Create "Learning" Organizations

Old Strategies	Emergent Strategies
Train your top professionals	Provide training for all
Base pay on job duties	Recognize job skills
Recruit for employees	Engage in open succession planning
Train for job skills	Train for problem solving
Put success behind you	Reward and communicate success stories

assimilate the values, norms, and the job skills they need to become the problem solvers we expect them to become?

We make a couple of essential mistakes. First, we equate all learning with either formal teaching or formal training. Second, we focus most of our managerial attention and investments on training. Third, at the first sign of hard times, we cut the training. The point here is that organizational learning takes place right under our noses every working hour of every work day. Most of us choose, as a matter of convenience, to focus only on formal training, as one component of organizational learning.

If we are to develop sophisticated problem solvers in our organizations, we will need to increase our commitments to the formal training agenda and, once again, discover, uncover, empower, and replicate that complex informal system of successful mentorships, peer networks, informal collaborations, and grapevines that exist already in the organization. We have perhaps all heard the apocryphal story, ascribed often to Xerox Corporation, of the efficiency zealot who restricted repair technicians' time at the water cooler only to discover later that repair times went up! The point of this parable, of course, is that learning occurs in a variety of unusual and little-understood ways in organizations. Again, technologists must explore new ways to promote organizational learning and to lever some of the unmanaged learning channels and mechanisms that operate already outside the formal systems of training and teaching.

For some of us, it will be tempting to interpret this message of discovery as a call for inaction. One might legitimately ask: If this learning is going on without my intervention, then why tamper with success? Our answer to this is that left unmanaged these forms of organizational learning are just that, "unmanaged." As such, these learning processes are at risk of being informed by myth and superstition and of being motivated by power and/or fear.

Technological Implications

Empowerment, with accountability, depends in part on a knowledgeable workforce. The information technology environment of the future should be designed to reduce, wherever possible, the need for unnecessary employee training and should enable, wherever necessary, employee learning. Computer or network instructions and interfaces must be intuitive to their users and access to supplemental expertise must be simple, ubiquitous, and available around the clock. IT organizations should strive to develop applications with sufficiently compatible "look and feel" to foster employee learning and mobility across campus processes and jobs.

Old Strategy:
Automate: IS used for processing control

New Strategy:
"Informate": information from systems used for process redesign

This distinction is well articulated by Shoshana Zuboff in her book, *In the Age of the Smart Machine: The Future of Work and Power.*[5] Her basic point is that our computer systems not only take over the work of the blue-collar worker when they automate some factory or clerical process, but in doing that, they also collect information about the work itself. This information is grist for the knowledge worker's mill, as he or she takes on the task of trying to improve the basic processes. Zuboff call this an "informating" process, and notes that it changes the jobs of the workers who actually do it. Our task is to ensure that our systems can deliver this kind of basic process information to knowledge workers, rather than hiding such information from them.

Old Strategy:
Structured and stable community

New Strategy:
Mobile and dispersed community

As we've been asked to shift our focus from the back-office worker to the knowledge generators and consumers of our institutions, we're now focusing on a

Figure 7
Support for Knowledge Workers: Matching Tools to Tasks

Category	Focus on	Orientation to	Who? e.g.	Tools	Supported by
Back office	Internal questions	Batch processes	Accounting clerks	Mainframes; process-oriented data	Internal and external EDI Process reengineeringing Distributed electronic forms Scalable servers Interoperabie servers and databases Legacy system encapsulation Outsourcing
Front office	Customers and suppliers	Batch processes	Departmental administrators	Client/ server systems; cross-functional data	Internal and external EDI Windowing, multisystem views Data warehousing Common user interface GUI integration, screen scraping Fax machines, e-mail Integrated data/image Distributed electronic forms Scalable clients Searchable document repositories Open, client/server systems
Knowledge development	Business solutions	Projects	Managers Professionals Faculty Students	Desktop tools; external data; enterprise data	Decision support system Multimedia e-mail Bulletin boards and electronic conferences Collaborative tools Computer-assisted meetings Videoconferencing Data analysis tools Mobile computing Scalable clients Training-free ATM-like interfaces Network navigators Current-awareness agents Open client tools

The leftmost columns of the matrix are provided from a Gartner Group analysis, "How IT Can Drive White Collar Productivity"

different community. Nicholas Negroponte mentioned this in his keynote address at the 1992 CAUSE Annual Conference: a college or university's knowledge workers are peripatetic. But not only do they move around a lot physically, they move around a lot intellectually—jumping from discipline to discipline—and they are usually more "loval" to their specialty than to their department. In addition, they are not concentrated in one place like the heads-down data entry clerks used to be, but they are scattered in ones and twos throughout our organizations. Think of the senior business managers in each of your large departments as an example.

If we are going to focus on the needs of our clients, we'll see that these folks need a different type of technical assistance structure and content from those we've been aiding through the help desk for so many years. Ultimately, we'll have to make independence easier than dependence, fostering the self-sufficiency and enterprise of this type of knowledge worker.

Old Strategy:
All-for-one, one-for-all solutions

New Strategy:
Match tool to task

In the 80s we provided very generalized tools and solutions to the masses, often encumbering tools with "featuritis" or providing lowest common denominator tools that met no one's needs in particular. Markets of the 90s appear to be much more specialized and focused than those of the 80s. Today we hear about vertical-market products that are customized to a specific market and that then dominate that market.

What is the equivalent of this in higher education? We can reasonably talk about market segmentation among the different types of knowledge workers in our institutions, based on what they do, what tasks they focus on, who they work for, and what tools and data they use in accomplishing all of this. Some specific technologies that the market place wants to provide to us are appropriate only for one or two segments of the higher education knowledge worker "market." If we have the challenge from our institution to provide better support for knowledge workers, we need to first figure out who we mean, and then decide whether the solution is videoconferencing, electronic forms, electronic mail, or collaboration tools.

Figure 7 is an attempt to segment our higher education market and suggest which tools might be of high value to which segments. For example, if we need to improve the productivity of accounting clerks, we should probably consider EDI and reengineering strategies, rather than teaching them how to surf the Internet with a network navigator, or providing them with automated-teller-style interfaces.

Throughout these discussions, we have been comparing an old and a new way of thinking and managing. While it is becoming clear that the "old" way is something we can't do anymore, unfortunately the "new" way is not entirely feasible yet. As technologists we are, as the poet said, standing between two worlds, one dying, the other waiting to be born. As general managers, however, we are not paid to be standing by; it is part of our jobs to husband, or midwife, or usher, if you will, the best new ways of thinking and working into the standard practice of our institutions, and among our colleagues and staff.

[1] Samuel Kirkpatrick, "Strategic Planning as Normal Operations: A Revolutionary Idea," the keynote address to the 1992 meeting of the Society of College and University Planners (SCUP).

[2] Michael Hammer, "Reengineering Work: Don't Automate, Obliterate," *Harvard Business Review*, July-August 1990, p. 104.

[3] Thomas H. Davenport, Robert G. Eccles, and Laurence Prusak, "Information Politics." *Sloan Management Review*, Fall 1992, p. 53.

[4] From remarks prepared for a symposium at UCLA by Richard C. Atkinson, University of California, San Diego, June 22-23, 1994, entitled: "Reinventing the Research University."

[5] Shoshana Zuboff, *In the Age of the Smart Machine* (New York: Basic Books, 1988).

3 Building Tomorrow's Organization

Several days after the fifth "trend" meeting, the president began to pull together her thoughts on the ideas that had been shared. She was more optimistic than before the meetings, but knew there was much to be done to begin preparing for change. She drafted a letter to the provost, vice president for administrative affairs, and vice provost for information resources, which read as follows:

Colleagues:

Unfortunately we know more about what is suboptimal about today's campus administrative organization than we know about the organization of tomorrow. What we do know, however, suggests that our institution can adopt strategies and take actions to be positioned well for the demands of the twenty-first century. We should explore a number of strategies and approaches.

- **Open an import/export idea bank.**

College and university faculty pride themselves on their critical reasoning abilities. Some administrators, unlike faculty, tend to view critical reasoning as antithetical to, or in conflict with, the open-minded airing and assessment of new ideas. Popular productivity-enhancement strategies or programs like TQM and BPR have merit. Such strategies should be subjected to an open and critical assessment. New ideas from industry should neither be rejected categorically as "irrelevant to our unique mission and special conditions," nor uncritically embraced as "magic bullets." The most important themes emerging from private industry absolutely deserve a central place in higher education's administrative agenda. These themes admonish us to (1) manage our responsibilities in a disciplined and informed fashion (management by fact); (2) focus our priorities on improving the quality of service to our primary customers; and (3) recognize that stovepiped organizations impede cross-functional and institution-wide breakthroughs. Establishing the culture and infrastructure of an import/export idea bank also suggests a new partnership between the academic and administrative spheres of campus activity. In particular, administrators need not only to take better advantage of their faculty's expertise, but also to uncover elements of the faculty learning process itself. That is, we need to emulate in our administrative activities the faculty's ability to identify, assess, diffuse, and assimilate information and knowledge in an era when information is in a condition of oversupply.

- **Remove obstacles and build bridges.**

Many of us in central campus administration appear to others the operators of feudal baronies which have been optimized for protection against attacks by marauding chancellors, deans, students, faculty, and each other. Instead of walls, moats, and drawbridges, we have constructed policies, procedures, delegations, and information systems to institutionalize (read depersonalize) our intent to say "no." To meet the challenges of the next century, we must begin to interrogate these obstacles honestly and critically and, where appropriate, to dismantle them. Here, information technology professionals must play a leadership role. Together we must design our campuses' technology architecture to optimize for openness and ease of use, and develop a network infrastructure that promotes access. Boundarylessness—across technology applications, organizations, functions, and institutions—should become the central driver of our information technology plans and programs.

- **Reward behaviors that promote innovation and teamwork.**

If our policies, procedures, forms, delegations, and systems have produced the foundation and bricks for our administrative walls, our personnel policies and programs have provided the mortar and reinforcing bars. These policies and programs have institutionalized our tendencies towards administrative specialization through complex and constraining job classification systems and schemes. Such specialization has fostered a "not in my job description" administrative culture that is antithetical to innovation and which is dehumanizing, ultimately, to our administrative colleagues. We have also configured our incentives to motivate individual performance and to reward expertise. Such incentives, absent clearly defined goals and objectives, reinforce pressures for specialization of work and workers, put us in competition with one another, and diminish our capacity to deliver service or to leverage the benefits of new management approaches.

I am heartened by prospects that have come out of the series of meetings we have just concluded. While the challenges are substantial, your suggested approaches to organizational change and the ways in which information technologies can facilitate and leverage that change provide a way for us to navigate an affordable course. I hope others will follow our lead!

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A discussion of a "network organization" vision which the authors see as a necessary response of colleges and universities to challenges of the 1990s. Strategies set forth in this paper support an information-intensive modern higher education institution, requiring increasingly sophisticated leadership and an administrative infrastructure which is optimized for service, speed, quality, and productivity. Funded by the IBM Corporation. 22 pages. 1992. *$8 members, $16 non-members.*

#9 ***Reengineering: A Process for Transforming Higher Education***
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An overview of the principles and processes of reengineering (transformation) to move higher education enterprises into the new information/service economy. Includes a review of philosophies already widely used in business, applications in higher education, and implications of reengineering for information technology units. Funded by Coopers & Lybrand. 32 pages. 1992. *$8 members, $16 non-members.*

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by Anne Woodsworth and Theresa Maylone

An exploration of the idea that professionals who manage information on campus—whether from the computing or library community—are part of a single "job family." The authors report results of a study designed to determine how similar or dissimilar jobs were in libraries and academic computing in selected universities, and to test a methodology for measuring their comparability. Published in cooperation with the Association of College & Research Libraries and the College and University Personnel Association. Funded by Apple Computer, Inc. 28 pages. 1993. *$12 members of CAUSE, ACRL, and CUPA, $24 non-members.*

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by Linda H. Fleit

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A joint publication of CAUSE and the League for Innovation in the Community College

The Learning Action Plan

A New Approach to Information Technology Planning in Community Colleges

By Jan A. Baltzer

Focusing on what institutions of higher education need to succeed and survive in the information age, ***The Learning Action Plan*** offers the information technology leader on campus a blueprint for creating a unique and workable strategic plan for IT in support of his or her institution's mission.

This new paper offers philosophical reasons for and pragmatic ways to design a new type of strategic plan for information technology in higher education using the Learning Action Plan model.

This model, illustrated by the experiences of several community colleges, incorporates six key success elements not always found in traditional planning methods: alignment, shared vision, strategic principles, the IT organizational structure, business process reengineering, and continuous feedback. With an emphasis on the importance of organizational culture, customer communities, and current technology base, this model focuses on what the IT organization must do to remain a vital and contributing part of the institution.

One complimentary copy of The Learning Action Plan *has been sent to each CAUSE member campus and all community colleges in North America. Additional copies can be purchased for $15 from either CAUSE or the League.*
***The Learning Action Plan*, funded by IBM; 44 pages, 1994; $15**

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Contract Management or Self-Operation

A Decision-Making Guide for Higher Education

Sponsored by CHEMA, the Council of Higher Education Management Associations

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The publication includes case studies and decision matrices for several functional areas on campus, including facilities, bookstore, dining services, administrative computing, child care, and security.

Contract Management or Self Operation, 87 pages, 1993
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